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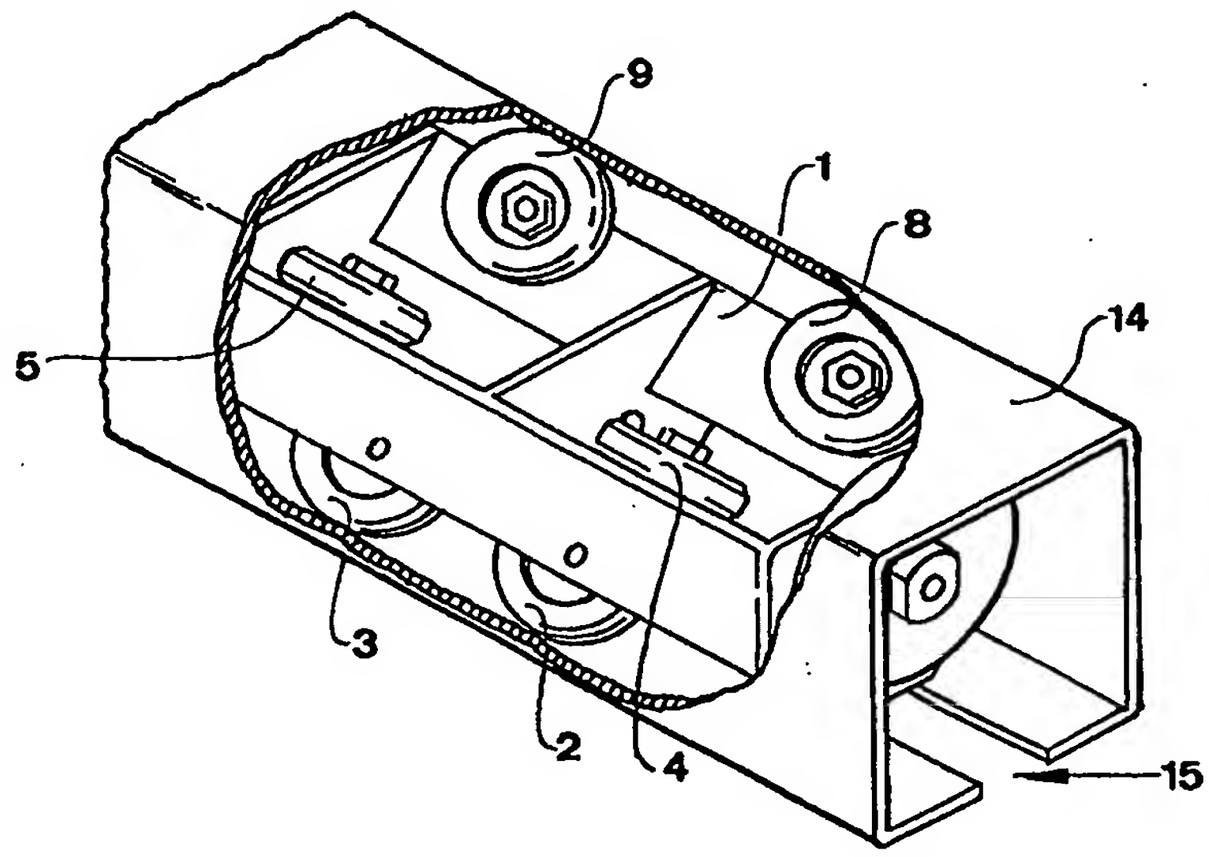

(57) Abstract

An arrangement for displacing an object comprising a carriage (1) and an elongated element (14), the carriage being arranged in connection to the element in an active position for displacing the carriage in the longitudinal direction of the element, the carriage having at least one wheel (2, 3, 4, 5, 8, 9) for contacting a first surface of the element, said wheel being arranged to contact the first surface when a load is applied to the carriage in a first direction and to roll on the first surface during displacement of the carriage, wherein at least one wheel (2, 3, 4, 5, 8, 9) of the carriage is arranged to contact and during the displacement to roll on a second surface of the element, which is separate from the first surface, when a load is applied to the carriage in a second direction opposite the first load direction.

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AN OVERHEAD TROLLEY CARRIER RUNNING IN A HOLLOW PROFILE

FIELD OF THE INVENTION AND PRIOR ART

The present invention is related to an arrangement for displacing an object according to the preamble of claim 1. The field of the invention is related to conveyors, in which a carriage is located inside or in connection to an elongated element for being displaced inside or along the element in the longitudinal direction of the element. Such elongated elements are, according to prior art, usually arranged so that they extend in the horizontal direction, wherein the carriage is intended to be subjected to a pulling force, for instance by an object being connected to the carriage so that it hangs below the elongated element, and moved in the longitudinal direction of the element when the carriage is displaced. According to one type of such arrangements, the elongated element has a tubular shape, and the carriage is arranged inside the element. The elongated element thereby having an opening extending in its longitudinal direction, wherein the object to be displaced is intended to be connected to the carriage through the opening. The carriage may further either be displaced manually by means of a force applied to the object by hand or by a force applied to the means connecting the carriage with the object or mechanically by arranging a driving device inside or outside the tubular element in order to drive the carriage. According to prior art, carriages have one or a plurality of wheels for contacting a lower surface inside the tubular element and for rolling on said surface during displacement of the object.

The elongated element of a displacement arrangement according to prior art and described above is intended to extend in a

substantially horizontal direction. It is not possible to use such an arrangement for displacing objects in a direction substantially separated from the horizontal direction, for example in a vertical direction, due to the arrangement of the carriage inside the element where the wheels of the carriage only are arranged to contact and roll on a lower surface in the tubular element. It is further not possible to apply a load on the carriage resulting in that the wheels lose contact with said surface due to the fact that said wheels of the carriage only are arranged to contact a lower portion in the tubular element.

Previously known displacement arrangements, in which the carriage is driven inside the element by means of driving means, have a relatively low accuracy, which in certain load cases is due to the fact that the contact pressure from the wheels against the element is limited.

SUMMARY OF THE INVENTION

The object of the present invention is to obtain a displacement arrangement, which eliminates at least one of the above mentioned disadvantages of conventional displacement arrangements.

This object is achieved according to the invention by at least one wheel of the carriage being arranged to contact, and during displacement of the carriage, to roll on a second surface of the element, which is separate from the first surface, when a load is applied to the carriage in a second direction opposite the first load direction. This makes it possible to apply a load to the carriage in two opposite directions.

According to an embodiment of the invention, at least a first wheel of said wheels is arranged to interact with the first surface of the element when the carriage is arranged in the active position, and at least a second wheel of said wheels is arranged to

interact with the second surface. This implies that the carriage does not need to be moved in the load direction when the load is changed from being applied from the first direction to being applied from the second direction or vice versa.

According to another embodiment, a third wheel and a fourth wheel of said wheels are arranged to interact with a third and a fourth surface, respectively, of the element, each of which being separate from the first and the second surface. This implies that the carriage obtains a more stabile position relative to the element, and conditions are created for applying loads to the carriage in directions separate from the first and the second load direction.

According to another embodiment of the invention, the carriage has means for adjusting at least two of the wheels to at least two different positions in relation to the carriage in order to adapt the carriage to different elements. "Different elements" refers in this case both to elements having different cross section shapes and elements having the same cross section shape but different sizes.

According to another embodiment, the carriage is intended to be arranged inside a tubular element. This leads to the carriage being protected from the environment outside the element, which is preferable when such environment comprises dust, dirt, and other elements, which might obstruct the motion of the carriage in the longitudinal direction of the element.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the appended drawings, a more specific disclosure of embodiment examples follows hereinafter.

Fig. 1 illustrates a partly cut perspective view of the inventive arrangement according to a first preferred embodiment,

wherein a carriage is arranged inside a schematically show tubular element.

Fig. 2 illustrates a side view of the inventive carriage according to fig. 1.

Fig. 3 illustrates a partly cut cross section view of the inventive carriage according to the indication III-III in fig. 2.

Fig. 4 illustrates a partly cut cross section view of the inventive carriage according to the indication IV-IV in fig. 2.

Fig. 5 illustrates a cross section view from the front of the inventive arrangement, where a carriage according to the first embodiment is arranged inside a tubular element, and where, according to the first embodiment, a casing is arranged around the element.

Fig. 6 illustrates a partly cut cross section view schematically illustrating the adjustability of a wheel of the carriage.

Fig. 7 illustrates an application of the inventive arrangement according to a second embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Figure 1 illustrates a partly cut perspective view of the inventive arrangement according to a first preferred embodiment. A carriage 1 is arranged inside a tubular, elongated element 14 with a rectangular cross section shape. The carriage 1 has eight wheels 2-9, each of which being intended to contact one corner of the tubular element 14. Each of the wheels has two bevelled surfaces in order to increase the contact surface against the inner surfaces of the element. The wheels 2-9 are arranged inclined, preferably subtended at an angle of 45° with the lateral

direction of the carriage 1. The carriage 1 has means 10 for adjusting the lower wheels 2, 3 in figure 2, which is also the case for the lower wheels 6, 7 not shown in figure 2. The adjustment means 10 are accessible from the outside of the carriage and are intended to be manœuvered before the carriage is applied in the tubular element 14. The adjustment means 10 may be designed in a plurality of different ways. According to the first embodiment, each of the wheels 2, 3, 6, 7 is connected to the carriage body by means of a screw-fastening, in which a screw 11 extends in parallel with the rotational axis of the wheel and is arranged excentrically in relation to the same. The wheel may thereby be moved steplessly between two end positions corresponding to a largest and least possible inner cross section area of the tubular element by operating the screw.

Figure 2 illustrates a side view according to figure 1. It is noted that the wheel 2 is arranged displaced in relation to the wheel 4 in the longitudinal direction of the carriage, and the wheel 3 is in the same way arranged displaced in relation to the wheel 5 in the longitudinal direction of the carriage. The reason for this arrangement is that an operator should be able to adjust the wheels 4, 5 while the carriage is arranged in the tubular element, which will be described in more detail below.

Figure 3 illustrates a partly cut cross section view according to the indication III-III in figure 2. The adjustment means 12 for adjusting the respective upper wheel 5, 9 are shown, wherein the manœuvering thereof will be explained in more detail in connection to the figures 5 and 6.

Figure 4 illustrates a cross section of the carriage according to the indication IV-IV in figure 2. The carriage has a member 13, which is intended for being subjected to a load, said member also being intended to at least partly extend through an opening provided in the elongated element in the longitudinal direction thereof.

Figure 5 illustrates a cross section of the inventive arrangement according to a first embodiment. The carriage 1 is arranged inside the elongated element 14. The wheels 2, 4, 6, 8 contact the four corners inside the rectangular element 14. The tubular element 14 has an opening 15 running in its longitudinal direction. It is possible to use the same carriage 1 for different tubular elements with quadrangular cross section shapes within an interval regarding their inner cross section area due to the adjustability of the wheels. The wheels 2, 3, 6, 7 for contacting a surface of the element portion provided with the opening 15 are adjusted so that the distance between the outer surfaces of the wheels 2, 6 and 3, 7, respectively, coincides with the distance between the inner surfaces of the side walls 16, 17 of the element 14 before the carriage 1 is installed in the element 14. The carriage 1 is thereafter located in the element 14, and the upper wheels 4, 5, 8, 9 are adjusted so that the wheels contact the side walls 16, 17, and the element wall 19 opposite the opening 15 while the carriage 1 is located in the element 14. The last mentioned adjustment takes place by that adjustment means accessible through the opening 15 are manœuvered so that the wheels 4, 5, 8, 9 are forced towards the respective corner, which will be explained in more detail in connection to figure 6. The wheels 2, 3 and 6, 7 close to the opening 15 will not restrict the accessibility of the adjustment means 12 due to the fact that the wheels 4, 5 and 8, 9, respectively, are arranged displaced in relation to the wheels 2, 3 and 6, 7, respectively in the longitudinal direction of the element 1.

In figure 5, the carriage 1 is provided with a member 13, which is intended for being subjected to a load. The load member 13 is arranged at least partly through the opening 15. The load member 13 may be acted upon in any direction in planes perpendicular to the longitudinal direction of the element without the carriage 1 being displaced in relation to the element 14 in said planes due to the fact that the wheels are arranged against the

respective corner in the element 14. A casing 20 is arranged around the element 14 and connected to the carriage 1 via the load member 13. For instance, the casing 20 has the same length as the one of the carriage 1 in the longitudinal direction of the element 14. The casing 20 will thereby be displaced outside the element 14 when the carriage 1 is displaced inside the element 14. Loads may be applied to the arrangement in any direction substantially perpendicularly to the longitudinal direction of the element 14 due to the arrangement of such a casing.

In the light of the description above, it is possible to design a system with a plurality of arrangements according to the first embodiment of the invention in order to displace an object in both two and three dimensions. In such a system, two elongated elements are arranged in parallel with each other in the horizontal plane and at a distance from each other, said elements both being provided with a carriage 1 and a casing 20 connected thereto. A third element is fixed to the respective casing and runs substantially perpendicularly to the longitudinal direction of the parallel elements. The transverse element is further provided with a carriage. It is thereby possible to displace an object connected via the load member of the carriage in the transverse element within the two-dimensional space between the two parallel elements.

It is possible to direct the element 14 in any direction in space due to the fact that the wheels 2, 3, 4, 5, 6, 7, 8, 9 of the carriage 1 are arranged contacting the four corners in the element 14. Thus, it is possible to arrange the elongated element 14 in a substantially vertical direction. The carriage 1 may be displaced within the element 14 extending in the vertical direction by means of, for example, a hydraulic cylinder. Thus, it is possible to extend the above mentioned two-dimensional system to a three-dimensional system. By, in the same way as described above, arranging two parallel, elongated elements in the horizontal plane at a distance from each other and a third element

extending perpendicularly to their longitudinal direction, said third element being connected to the casings around the parallel elements, the two-dimensional system is obtained. By, in the same way, arranging a set of three elongated elements at a distance in the vertical direction from the two-dimensional system and by connecting the casings of the two transverse elements with a further element running in the vertical direction, an object connected to a carriage in the further element running in the vertical direction, it is possible to move the object in three dimensions. The carriage located in the element running in the vertical direction is preferably connected to a casing around the element. The object connected to the casing may be displaced to a desired position within the three-dimensional space by arranging driving means for driving the respective carriage in the respective element. Such driving means may, for example, be constituted by a flexible means running around two shafts arranged at a distance from each other in the longitudinal direction of the element, said flexible means being connected to the carriage, and a power source connected to one shaft. The flexible means may, for example, be formed by a chain, a belt, or similar. It is possible to displace the carriages to the desired positions in a simple and functional way by arranging a control unit connected to said driving means.

Figure 6 illustrates an enlarged and partly cut cross section view of the adjustment means 12. The adjustment means 12 are intended to be accessible through the opening 15 when the carriage 1 is arranged within the element 14 in order to force the wheels 4, 5, 8, 9 towards the corners in question. The adjustment means 12 may, within the scope of the inventive claims, be formed in a plurality of different ways. According to the first embodiment, the wheels are moved towards the corners by means of spring forces. A piece 22, movably arranged in a channel 21, is fixed to a shaft 23 of one of the wheels. The channel 21 extends within the body 24 of the carriage 1 in such a direction that the wheel connected to the piece 22 is moved in a substan-

tially diagonal direction within the element 14 when the piece 22 is moved within the channel 21. A tightening screw 25 is arranged accessible from the interior of the element 14 and connected to a disc 26 arranged in the channel 21, the disc in turn being connected to the piece 22 by means of a spring member 27. The piece 22 will be subjected to a spring force when the screw 25 is screwed, and thereby be moved inside the channel 21, which results in the wheel shaft 23 being displaced so that the wheel connected to the shaft is forced towards the corner in question. The body 24 is provided with a hole arranged in the extension of the channel 21, wherein the hole has a threading corresponding to the threading of the screw 25. The screw 25 has a recess 28 at the end opposite the disc 26, the recess being intended for being operated with a tool through the opening 15 in the element 14 in order to achieve a screwing motion of the screw 25. The recess 28 has, for example, a hexagonal shape.

Figure 7 illustrates a second embodiment of an application of the inventive arrangement. An elongated element 14 is in this case arranged in a substantially horizontal direction. A table 29 is arranged below the elongated element 14, and a number of plates 30 are piled up on the table. The table 29 and the element 14 are movably arranged relative to each other in the vertical direction. The object of the arrangement according to figure 7 is to move a number of plates 30 from the first table 29 to a second table 31. A displacement device 32 is connected to the load member 13 by means of a piece 33 and an arm 34 extends obliquely downwards from a first end of the piece 33, said arm being provided with an effect member 35 at its lower end. The arm 34 is pivotably connected to the piece 33 by a hinge 36. A hydraulic cylinder 37 is connected on one hand to the piece 33 at a distance in the longitudinal direction of the element 14 from the hinge 36, and on the other hand to the arm 34 in the vicinity of the effect member 35. A horizontal contact surface 38 of the effect member 35 will be brought into contact with an upper

surface of the plate located on top in the pile 30 when the first table 29 and the element 14 are moved in relation to each other in the vertical direction. The effect member 35 is further provided with a portion 39 intended to be brought into contact with the edges of a number of plates in the pile 30. The contact surface 38 will be brought into contact with the plate on top in the pile 30 when the first table 29 and the element 14 are moved in relation to each other in the vertical direction, and a force upwards, in the vertical direction, will be applied to the device 32, which results in the carriage 1 being subjected to a load. The upper wheels 4, 5 and 8, 9 are thereby forced towards the element wall 19 opposite the opening 15. The hydraulic cylinder 37 will be compressed at the loading. The relative motion in the vertical direction will be stopped when the hydraulic cylinder 36 has been compressed to a certain, pre-determined extent, i.e. the distance between its points 40 and 41 of suspension has been reduced, and the carriage will thereafter be displaced in the longitudinal direction of the element 14, i.e. to the left in figure 7, resulting in a number of plates in the pile 30 being moved to the second table 31. The last mentioned motion is counteracted by friction. The displacement of the carriage 1 suitably takes place by means of driving means arranged in the element 14, which are constituted by a flexible means 44 extending around two shafts 42, 43 arranged at a distance from each other in the longitudinal direction of the element 14, said flexible means being connected to the carriage 1 and said driving means further comprising a power source (not shown) connected to one of the shafts 42, 43. The number of plates moved from the first table 29 to the second table 31 depends on the distance in the vertical direction between the contact surface 38 and the lower end of the portion 39 of the effect member 35. The friction force counteracting the displacing movement will thereby act between the lower surface of the lowermost plate, which the portion 39 reaches when the contact surface 38 contacts the upper surface of the uppermost plate in the pile, and the upper surface of the

plate in the pile 30 contacting said, lowermost plate to be moved.

The inventive arrangement has been described with an elongated element 14 having a substantially quadrangular inner cross section area. Such rectangular elements, so-called square tubes, are commercially available to a low cost. The relatively simple design of the carriage results in the combination of the carriage and the square tube forming an economically advantageous arrangement. It is possible to utilise only one carriage for square tubes with inner cross section areas within a certain area interval due to the adjustment of the wheels. The construction with adjustable wheels may, however, advantageously be used for elements with a cross section shape differing from a rectangular one, such as a circular shape. It is preferable that the carriage is enclosed in the element when the arrangement is used in an industrial environment, where dust, dirt, and similar stuff are present.

Flexible sealing means are preferably arranged in the opening in order to reduce the amount of undesired particles within the element. These flexible sealing means may, for example, be formed by a rubber border attached to the respective side of the opening, wherein the rubber borders contact each other substantially in the central portion of the opening. The load member 13 will be movable along the opening due to the flexibility of the sealing means while the sealing means are being pushed aside in the transverse direction of the opening where the load member is located. The sealing means are further intended to contact each other along the portions of the opening where the load member is not located.

The inventive carriage may, however, within the scope of the inventive claims, be designed so that it may be applied to an elongated element, which is not provided with an interior, sub-

stantially enclosed space. Such an element may, for example, be constituted by an I-beam.

It should be noted that the embodiment described hereinabove and illustrated in drawings only should be considered as exemplifying. Thus, the invention may be realised in different ways without leaving the scope of the invention. It should particularly be pointed out that men skilled in the art after having been presented to the inventive idea, of course, are capable of carrying out different modifications of the exemplifying embodiment without leaving the scope of the inventive claims.

Thus, the inventive arrangement is arranged to be subjected to loads in more than one direction in contrast to prior art, where the carriage is only subjected to a pulling load in one direction. The inventive carriage is arranged to be subjected to pulling loads in different directions, pressure loads in different directions, or combinations of the two load types.

The mentioned first, second, third, and fourth surfaces of the element 14, which are mentioned in the claims, may be constituted by portions of surfaces of the element, which means that two surfaces defined to be separate from each other may be constituted by two surface portions located at a distance from each other on one larger surface of the element. Arranging one wheel in contact with a first surface of the element, does not exclude that said wheel contact further surfaces. This is, for example, the case in the first preferred embodiment of the carriage, where the respective wheel is arranged against surfaces of two walls, which together define one corner.

Claims

1. An arrangement for displacing an object comprising a carriage (1) and an elongated element (14), the carriage (1) being arranged in connection to the element (14) in an active position for displacing the carriage (1) in the longitudinal direction of the element (14), the carriage having at least one wheel (2-9) for contacting a first surface of the element, said wheel being arranged to contact the first surface when a load is applied to the carriage in a first direction and to roll on the first surface during displacement of the carriage, characterised in that at least one wheel (2-9) of the carriage (1) is arranged to contact, and during displacement of the carriage (1) to roll on a second surface of the element (14), which is separate from the first surface, when a load is applied to the carriage (1) in a second direction opposite the first load direction.

2. An arrangement according to claim 1, characterised in that at least a first wheel (2, 3) of said wheels is arranged to interact with the first surface of the element (14) when the carriage (1) is arranged in the active position, and at least a second wheel (8, 9) of said wheels is arranged to interact with the second surface.

3. An arrangement according to claim 2, characterised in that the first wheel (2, 3) and the second wheel (8, 9) are arranged to permanently contact the first and the second surface, respectively, when the carriage (1) is arranged in the active position.

4. An arrangement according to claim 2 or 3, characterised in that a third wheel (6, 7) and a fourth wheel (4, 5) of said wheels are arranged to interact with a third and a fourth surface, respectively, of the element (14), each of which being separate from the first and the second surface.

5. An arrangement according to claim 4, characterised in that the third wheel (6, 7) and the fourth wheel (4, 5) are arranged to permanently contact the third and the fourth surface, respectively, when the carriage is arranged in the active position.

6. An arrangement according to claim 5, characterised in that each of said wheels (2-9) is arranged substantially diagonally towards a corner of the element (14) in the transverse direction of the element (14).

7. An arrangement according to any of the claims 2-6, characterised in that the carriage (1) has means (10, 12) for adjusting at least two of the wheels (2-9) to at least two different positions in relation to the carriage (1) in order to adapt the carriage (1) to different elements.

8. An arrangement according to claim 7, characterised in that the rotational axis of the respective wheel (2-9) extends in the same direction in the two positions, and that, in a first position, the rotational axis is arranged in a location at a distance in the transverse direction of the element (14) from the location of the rotational axis in a second position.

9. An arrangement according to claim 8, characterised in that the adjustment means (12) for adjusting at least two of the wheels (4, 5, 8, 9) are provided with an elastic member (27) each for adjusting the wheels against an elastic force.

10. An arrangement according to any of the preceding claims, characterised in that the element (14) has a tubular shape.

11. An arrangement according to claim 10, characterised in that the carriage (1) is intended to be arranged inside the tubular element (14).

12. An arrangement according to claim 10 or 11, characterised in that the element (14) has a rectangular inner cross section area.

13. An arrangement according to any of the claims 10-12, characterised in that the element (14) has an opening (15) extending in the longitudinal direction of the element (14).

14. An arrangement according to claims 7 and 13, characterised in that the adjustment means (12) are accessible via the opening (15) when the carriage (1) is arranged inside the element (14).

15. An arrangement according to any of the preceding claims, characterised in that the carriage (1) has a member (13) for applying the load onto.

16. An arrangement according to claims 13 and 15, characterised in that the load member (13) is extending through the opening (15) when the carriage (1) is arranged inside the tubular element (14).

17. An arrangement according to claim 16, characterised in that the arrangement comprises a casing (20) connected to the load member (13), the casing being arranged around the tubular element (14).

18. An arrangement according to any of the claims 13, 14, 16, or 17, characterised in that the tubular element (14) has flexible sealing means arranged in the opening (15).

19. An arrangement according to any of the preceding claims, characterised in that the arrangement comprises driving means for displacing the carriage (1) in the longitudinal direction of the element (14).

20. An arrangement according to claim 19, characterised in that said driving means has a flexible means (14) running around two shafts (42, 43) arranged at a distance from each other in the longitudinal direction of the element (14), said flexible means being connected to the carriage (1), and a power source connected to one of the shafts (42, 43).

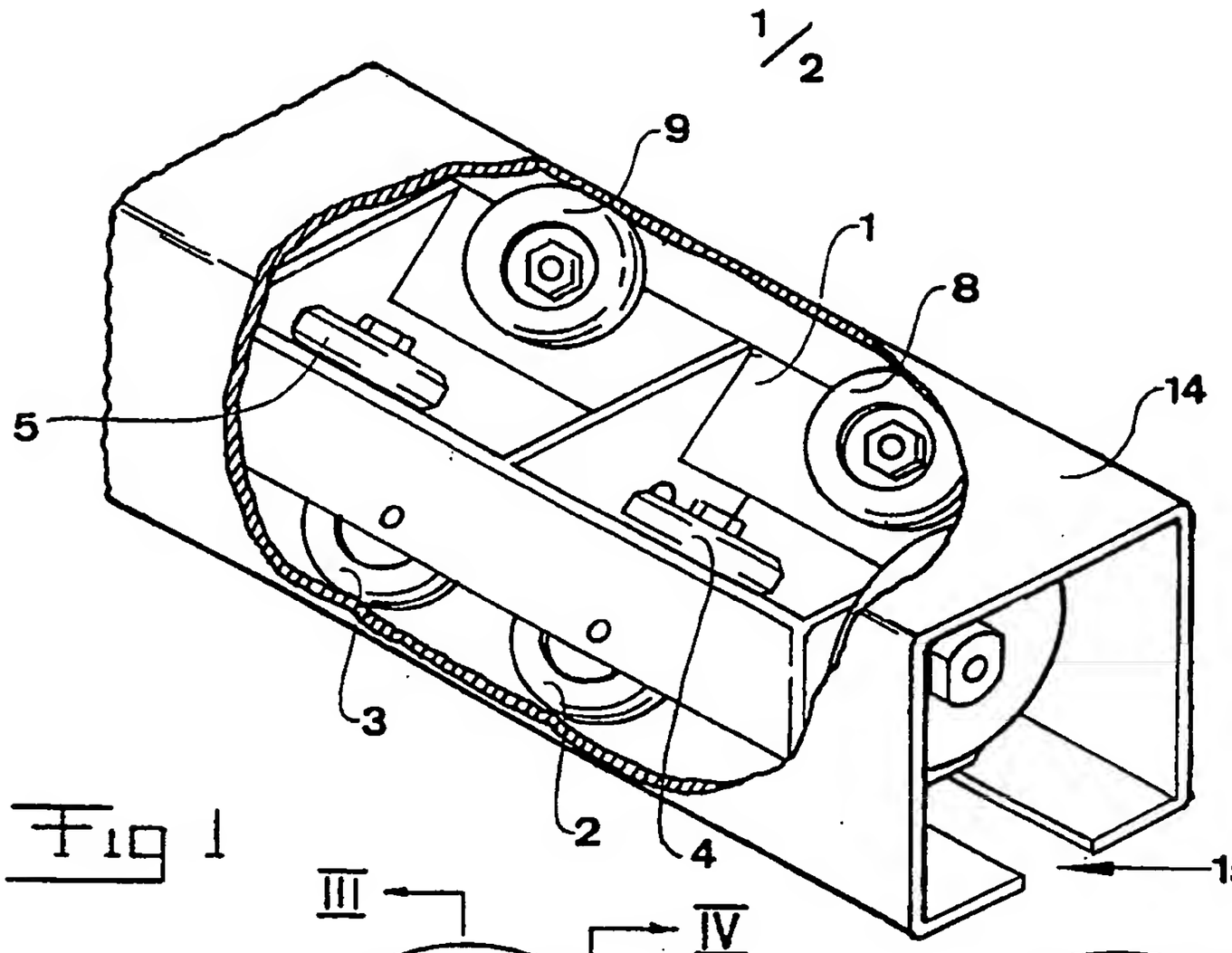

Fig 1

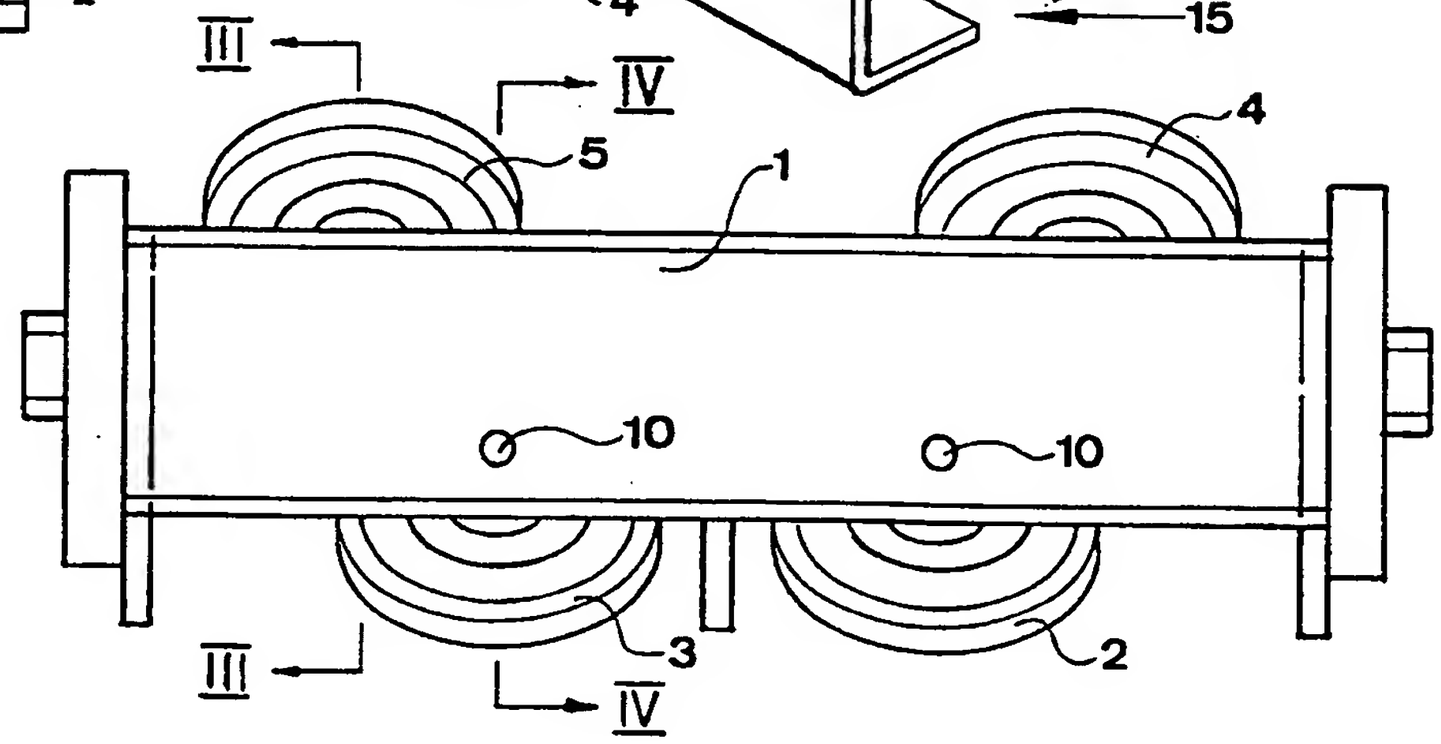

Fig 2

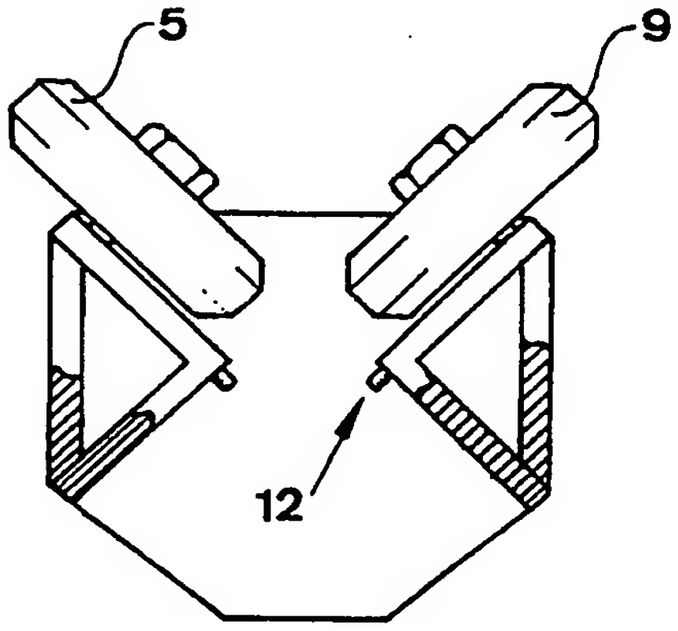

Fig 3

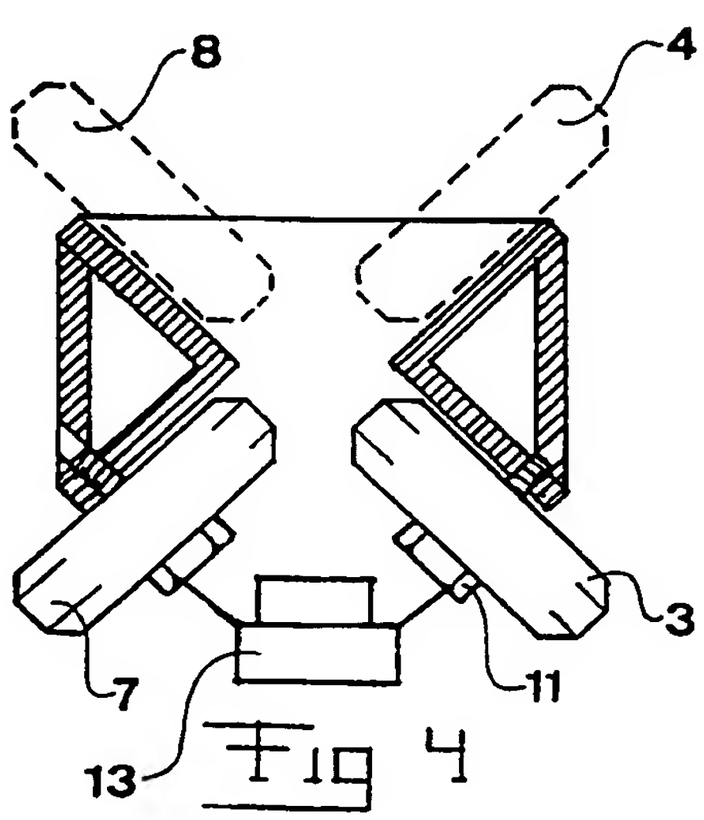

Fig 4

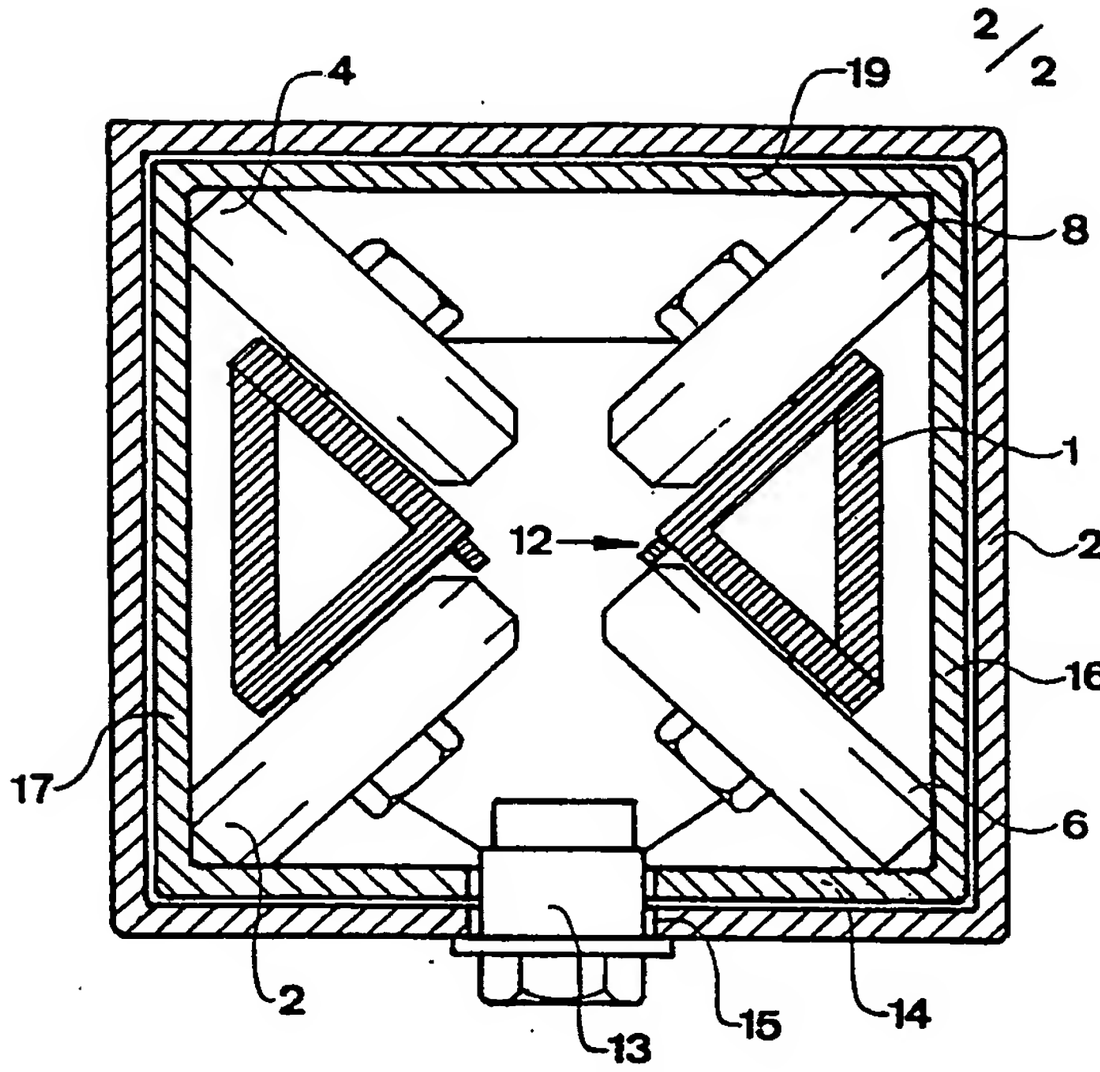

Fig 5

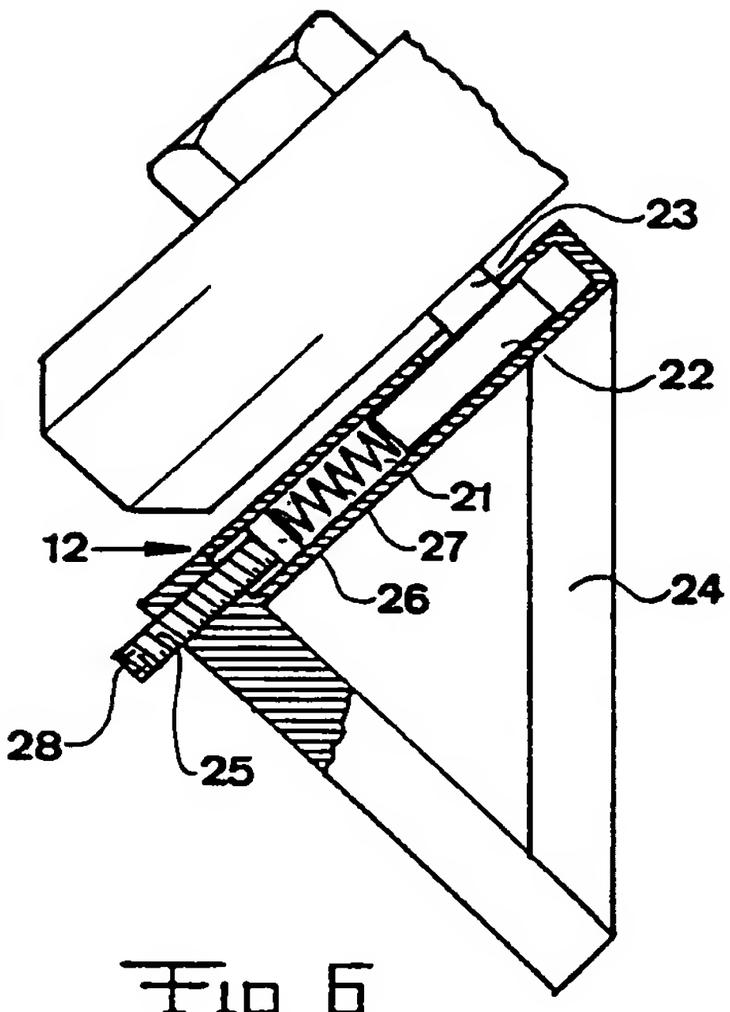

Fig 6

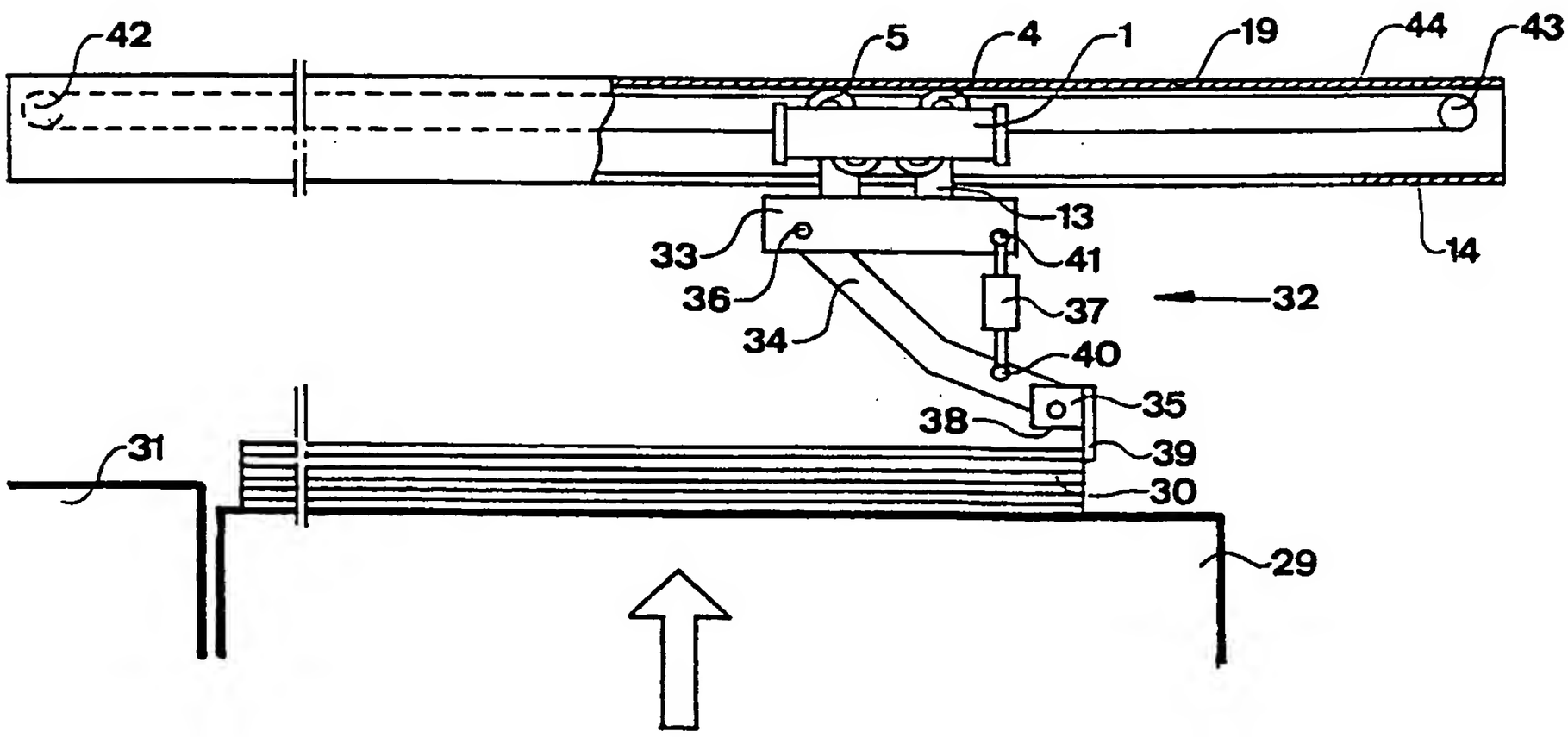

Fig 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 98/02337

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65G 35/06, B65G 17/20, B65G 21/20
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9108970 A1 (TRANSTEX PRODUKTIONSGESELLSCHAFT MBH), 27 June 1991 (27.06.91), figure 1, claims 1-6 ---	1,10-17,19
X	DE 2347459 A1 (BAUD, MICHEL), 10 April 1975 (10.04.75), figure 1, claim 1 --- ---	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 March 1999	21 -03- 1999
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Igor Gazdik Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/02/99

International application No.
PCT/SE 98/02337

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9108970 A1	27/06/91	DE 3941459 A	20/06/91
		DE 59008486 D	00/00/00
		EP 0458921 A,B	04/12/91
DE 2347459 A1	10/04/75	NONE	